

SPOTTED OWL MONITORING IN OLYMPIC NATIONAL PARK: 2010 ANNUAL REPORT



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Cover Photograph: Adult northern spotted owl with juvenile in the Graywolf River drainage,
by Erin Burke, NPS.

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EXECUTIVE SUMMARY

This report summarizes progress on the northern spotted owl (*Strix occidentalis caurina*) monitoring program in Olympic National Park in 2010. Monitored spotted owl territories in the national park, together with those visited by U.S. Forest Service Pacific Northwest Research Station in the surrounding Olympic National Forest, make up the Olympic Peninsula Demographic Study Area. This is one of eight study areas called for in the Northwest Forest Plan to estimate spotted owl population trends from demographic data and monitor the effectiveness of the plan.

National Park Service personnel monitored and managed data on a sample of 52 spotted owl territories (hereafter “sites”) in 2010 to determine their occupancy and reproductive status. Eighteen sites were occupied by spotted owl pairs, and three by single spotted owls, roughly 1/2 the level of occupancy in the early 1990’s and comparable to that of the last four years. We documented 14 nesting attempts, fledging a total of 20 juveniles. We located 41 non-juvenile spotted owls and confirmed the identity of 39 of these. Eighteen spotted owls were captured for banding, including 10 juveniles. At sites where any spotted owls responded in 2010, they were detected on an average of 80% of monitoring visits, suggesting that survey methods remain effective for locating spotted owls despite any changes in behavior related to barred owl presence.

Data collected 1990-2008 were analyzed at a workshop in Corvallis, OR in January of 2009. These results are being peer reviewed and will be released this winter. The most recent analysis of trends in northern spotted owl populations, completed in January of 2004, indicated continuing declines, particularly in the northern parts of the subspecies’ range. The overall rate of decline was 4.1% a year, slightly less than the estimate for the Olympic Peninsula. Female fecundity appeared stable, but the more important estimate of adult survival was declining in several areas, including the Olympic Peninsula. All four study areas in Washington State had evidence of both declining adult survival and declining populations.

Barred owls (*Strix varia*) were first documented on the Olympic Peninsula in 1985, and competition with this species is now the primary threat to the conservation of spotted owls in protected areas. Barred owls have been detected within 800 meters of 87% of monitored spotted owl sites in Olympic National Park. Although barred owls now occupy all or part of most spotted owl territories here, every occupied spotted owl activity center was found more than 800 meters from a barred owl detected this year, and only six were closer than this to a barred owl detected in a previous year. Occupancy of spotted owl sites has declined significantly following the first detection of barred owls in the area. Spotted owl territories which have remained occupied following detections of barred owls have both moved farther and increased in elevation relative to sites where barred owls are absent. Extensive areas of Olympic National Park that formerly supported spotted owls, including much of the western Olympics, now appear to support only barred owls. Most remaining spotted owls are found on steep, well-drained sites above 2000’ elevation.

INTRODUCTION

Olympic National Park (ONP) is located on the Olympic Peninsula in northwest Washington State. The park consists of 922,653 acres, of which 755,820 acres are forested valleys naturally fragmented by high elevation peaks and ridges. Due to the lack of historic timber harvest or recent stand-replacing natural disturbance, most of the forested landscape is dominated by stands older than 100 years. There is a marked precipitation gradient from rainforest valleys in the southwest to rainshadow areas in the northeast, and it is convenient to refer to two very different strata (hereafter east- and west-side). Drier, east-side forests tend to be younger and are dominated by Douglas-fir (*Pseudotsuga menziesii*). West-side forests have a lower frequency of fire and contain more shade-tolerant species such as western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Pacific silver fir (*Abies amabilis*), with varying amounts of Douglas-fir.

The Olympic Peninsula demographic study area consists of 54 northern spotted owl (hereafter spotted owl) territories monitored by Park Service crews in Olympic National Park and 45 territories monitored by U.S. Forest Service Pacific Northwest Research Station (PNW) crews in the surrounding Olympic National Forest. Site selection for the ONP portion of the study was not strictly random. Initially, all known sites were monitored. As additional sites were located in the course of surveying randomly located inventory plots, these were added to the sample if they were within a one day hike of a site already being monitored. Forty percent of the current sample of sites were monitored by 1990 and no sites were added or dropped after 1996. Funding and the logistics involved in monitoring sites as far as 24 miles from a trailhead determined the total number of sites that were feasible to monitor. We have continued to monitor sites regardless of their occupancy status and have also tried to keep them well distributed throughout the park, although we monitor fewer sites on the park's west side due to the lower density of spotted owls there. This study area, including both Park and Forest Service managed lands, is generally representative of habitat conditions on federal lands on the Olympic Peninsula, although the proportion of suitable habitat in the study area is somewhat higher than outside, owing to the higher proportion of National Park land (Appendix F, Anthony et al., 2006). It is not representative of state, private and tribal lands on the Olympic Peninsula, where there is little suitable habitat and few or no remaining spotted owls.

This report summarizes results of fieldwork, cooperative efforts and administration of National Park Service run portion of Olympic Peninsula Demographic Study during the 2010 breeding season. It is intended as a summary of results for administrators and cooperators, but does not present detailed methodologies or data analysis. Methods are described in Franklin et al. (1996).

Results from the PNW administered portion of the Olympic Peninsula study will be posted at: <http://www.fs.fed.us/pnw/olympia/wet/team-research/owl-res/index.shtml>

Reports from most cooperators in the Northwest Forest Plan's Northern Spotted Owl Effectiveness Monitoring Program are available at:
<http://www.reo.gov/monitoring/reports/northern-spotted-owl-reports-publications.shtml>

OBJECTIVES

The Olympic Peninsula demography study is one of eight areas where demographic rates are monitored to assess the effectiveness of the Northwest Forest Plan in preventing a further decline in spotted owl populations. ONP also provides a unique opportunity to understand the ecology of the northern spotted owl in a large area of suitable habitat with almost no history of timber harvest. The specific objectives of the study are to:

- 1) Document age-specific survival and fecundity to contribute to a range-wide assessment of spotted owl population trends, as required by the effectiveness monitoring component of the Northwest Forest Plan.
- 2) Monitor the effects of increasing barred owl populations on spotted owls.

2010 RESULTS

General Monitoring and Site Status

The project employed six full-time biological technicians, one Student Conservation Association intern, and the project lead. Crews made 233 visits (mean visits/site = 4.3, range 2-10) to 54 monitored spotted owl sites (Figure 1). Two of these sites were formerly monitored by PNW, and they will continue to manage those data. We report these site visits here, but the sample size for most analysis is 52 except where noted. Most visits (88%) were daytime searches, and crews focused their efforts on recently occupied activity centers, covering suitable habitat out to 2 km as time permitted. The full field crew (4-5 one or two-person teams) visited owl sites between March 30 and July 14, with some additional work continuing through August 13.

The winter of 2009-2010 began with near normal temperatures and much above normal precipitation, resulting in snowpack in the Olympic Mountains averaging over 200% of average by late November (NRCS data). Following a cool and dry December, a strengthening El Nino brought the warmest January on record to Seattle and declining snowpack in the Olympics, particularly at low elevations. The end of the unusually warm dry weather coincided with the beginning of the nesting season, and much of April-June was cooler and wetter than normal. Weather was particularly cold and wet during the late nesting and early fledging period.

Precipitation was recorded on 27% of site visits, in the form of heavy rain (9%), light rain (12%) or snow (6%). The only major access issue was the continued closure of the Dosewallips Road, which added 5.5 miles to the approach hike at four sites.

The 52 spotted owl sites monitored in 2010 represented a sample of roughly 23% of the 229 spotted owl territories estimated to occur in ONP as of 1995 (Seaman et al., 1996). The mean length of record was 18.4 years (range 15-19), not including years prior to 1992 when monitoring to current protocols began at most sites.

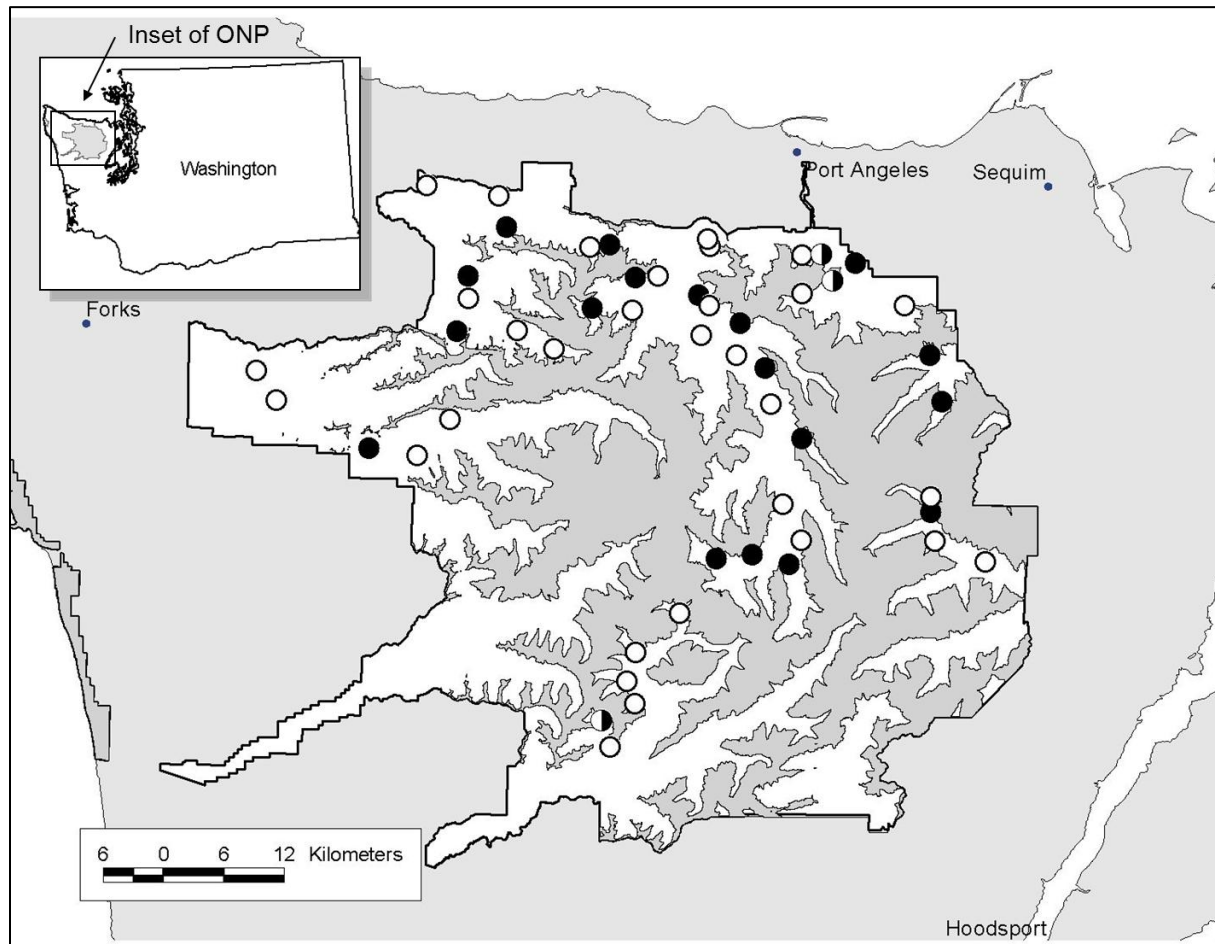


Figure 1. Location and occupancy status of 52 monitored spotted owl territories in Olympic National Park, 2010. Black dots are spotted owl pairs, half-filled circles are single owls and white circles are monitored sites with no response. Shaded area within the park boundary is high elevation non-habitat.

At least one spotted owl was detected at 21 (40%) of the monitored sites. Pairs were documented at 18 of these (Figure 2), including the first pair located at a monitored site on the park's west side in four years. We detected a total of 41 non-juvenile spotted owls, of which

22 were males and 19 were females. Of this population, 35 were adults three years of age or older, and six were subadults either one or two years old. Ten of the territorial owls detected this year were of known age (range 2-16 years) as a result of initial capture as juveniles or subadults. Because two sites had multiple owls of the same sex, the total number of owls defined as territorial residents is less than the reported number of owls detected.

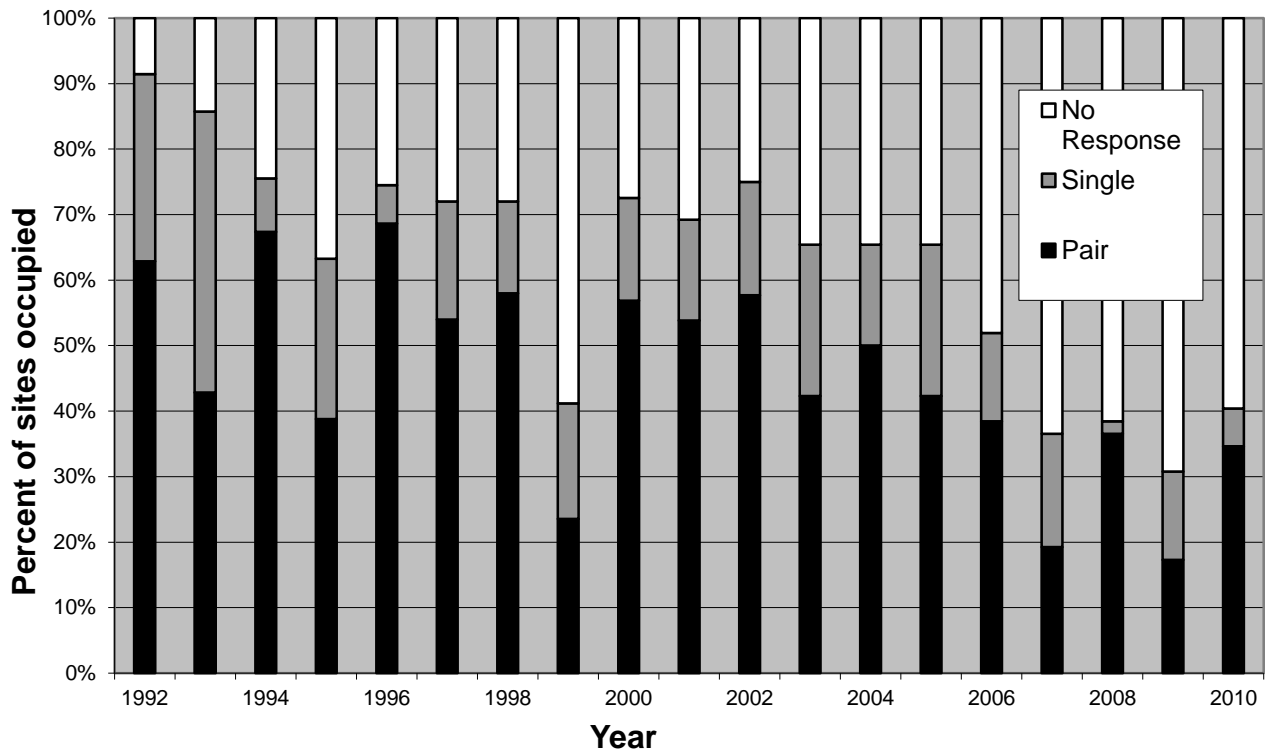


Figure 2. Percent of monitored spotted owl sites occupied by 0, 1, or 2 adult owls, Olympic National Park, 1992-2010.

When calculated for a fixed sample of spotted owl sites monitored from 1994-2010 ($N = 49$), the mean elevation of occupied sites has increased 566' to 2692'. Four sites were located below 2000' this year, representing a slight increase in occupancy at lower elevations from recent years. While there is clearly a relationship between elevation and the likelihood that a spotted owl site has remained occupied, models indicate that slope and topographic moisture explain more of the variance in occupancy than elevation alone (Gremel, 2005). However, in this landscape the steep, dry sites where spotted owls remain tend to occur at higher elevations. It is likely that all of these topographic variables are simply correlates for barred owl occupancy (see later section). Regardless of which factors are responsible, spotted owl distribution in the Olympics has changed radically over the course of this study. Remaining

spotted owls are increasingly restricted to the drier north and east Olympics, where they persist on sites with steep slopes at higher elevations, often in headwaters and side drainages.

Nest and Reproductive Monitoring

Spotted owl productivity (fecundity) is calculated as the number of female young produced per territorial female, assuming a 50:50 sex ratio of offspring. We determined the reproductive status of 17 of 18 territorial female spotted owls at monitored sites this season. Three did not attempt to nest and 14 nested, fledging a total of 20 young. One nest failed. The average fecundity of adult females was 0.63 ($N = 15$, $SD = 0.399$) and of subadult females was 0.25 ($N = 2$, $SD = 0.354$). Spotted owl fecundity in the Olympics has been highly variable, with years of high productivity often followed by years with little or no nesting (Figure 3).

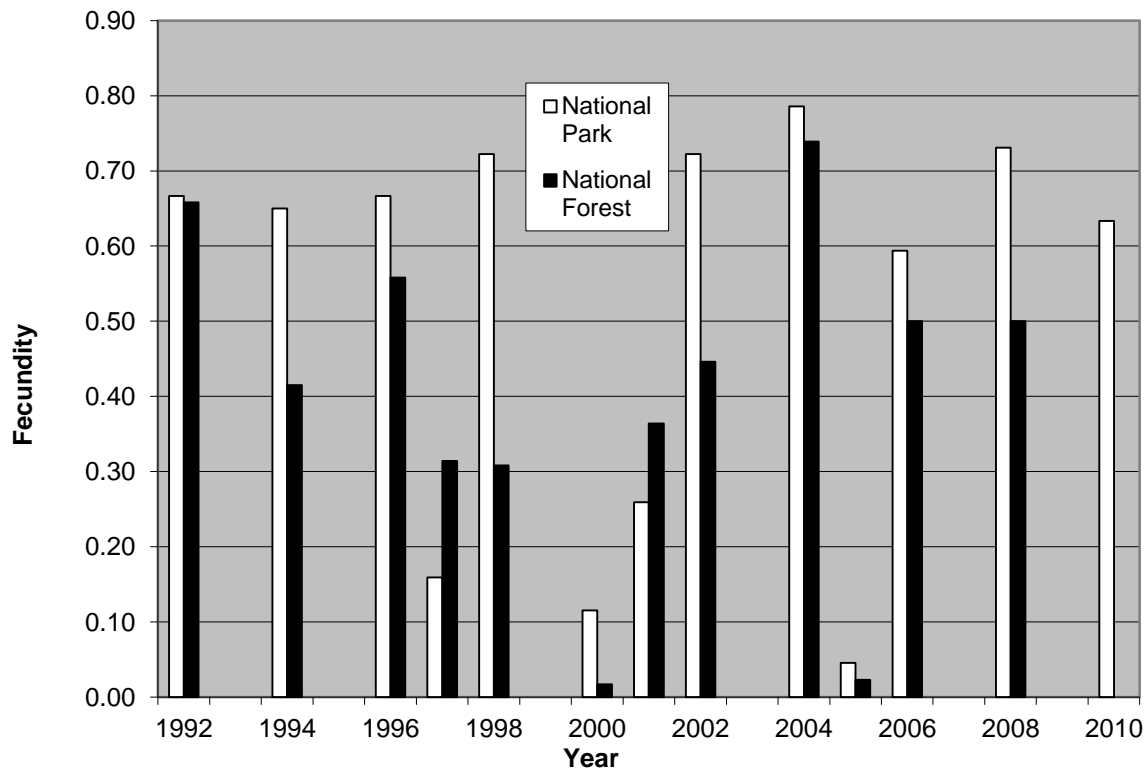


Figure 3. Olympic Peninsula adult spotted owl fecundity (mean # of female offspring/territorial female), 1992-2010. Includes both National Park (white bars) and National Forest (black bars). No young fledged from monitored sites on the National Forest in 2010.

The mean annual fecundity rate for adult female spotted owls in ONP ($N = 19$ years) was 0.36 (SE 0.076); the estimate for adult females over the range of the northern spotted owl was 0.37 (SE 0.029) (Anthony, et al., 2004).

The high year-to-year variation in female fecundity has been driven by the proportion of the population attempting to nest, and the productivity of those nests, rather than the rate of nest success, which averages 90% (Appendix 1).

Banding and Capture

Banding owls is necessary to identify individuals and estimate survival rates. All captured owls are fitted with a unique U.S. Fish and Wildlife Service number band. Adult and sub-adult owls are marked with a color band unique to a 16 km radius from the capture site, which enables field crews to identify these individuals without recapturing them. Juveniles receive a standard color band, which is changed if these birds are re-captured as adults on a new territory. We use established capture techniques for spotted owls (Franklin et al., 1996), and emphasize owl safety during training.

ONP crews captured 18 spotted owls in 2010. Eight were adult or subadult owls, including one adult recaptured to replace a juvenile band, and 10 were juveniles. Of the 41 adult or subadult spotted owls detected, we confirmed bands on 39 (95%). One resident single male and a second female at a site with a banded spotted owl pair could not be captured, but were believed to be unbanded. Park crews have performed 501 captures and banded 380 spotted owls since 1988.

We encountered problems with a new string of aluminum USFWS number bands. These size 7B lock-on bands were manufactured with a harder metal than in the past, and were nearly impossible to bend with the pliers in our banding kits without applying a tremendous amount of pressure. This unfortunately came to light on a tour that was focused on visiting nests to count and band juveniles, and several teams working independently attempted to apply these bands to five juvenile spotted owls. The initial band had to be cut or pried off the bird's leg in four cases when it could not be properly crimped. Three birds were ultimately banded with this series, and two juveniles were captured and released without banding. The USFWS has been very cooperative about resolving this issue and now has softer metal bands available. We would strongly urge other owl researchers to check any new band strings of the 7B lock-ons with the prefix 1857 or 1957 for this problem, and request replacements with the older style bands if discovered. An easy test is that the soft metal bands can be opened by hand, while the problem bands require pliers.

We captured and banded under ONP master station banding permit 22633 and U.S. Fish and Wildlife Service 10(a)(1)(a) "take" permit TE842449-3, expired February of 2009 with a renewal requested January of 2009.

Juvenile Dispersal

We recaptured one owl this year that was banded as a juvenile in a previous season. Nineteen of the 162 spotted owls banded as juveniles by ONP crews prior to 2010 have been recaptured as adults or sub-adults on the Olympic Peninsula. Five dispersed to Olympic National Forest, the others were found within ONP. The median dispersal distance for this sample was 15.8 km (mean 19.1 km, SD 10.0, range 5.3-41.8 km). The mean dispersal distance of females was 44% greater than that of males, but this difference was not statistically significant. The greater dispersal distance for females is consistent with results reported by Forsman et al. (2002) for a large sample of juveniles in Washington and Oregon. The mean age at recapture was 3.2 years, implying that most spotted owls spend several years as non-territorial "floaters" or on territories outside of our study sites before being detected. To date, we have documented no dispersal of spotted owls between the Olympic Peninsula and Cascade provinces.

Barred Owls and Hybrids

Barred owls have recently expanded their range into the Pacific Northwest. The first documented occurrence on the Olympic Peninsula was on the west side of ONP in 1985 (Sharpe, 1989), and the number of sightings continues to increase. Barred owls are dominant in competitive interactions with spotted owls and evidence from many areas suggests that barred owls displace spotted owls from otherwise suitable habitat (Dark et al., 1998; Hamer, 1988; Kelly, 2001, Gremel, 2005).

Barred owls are generally more wary of humans and appear to be less responsive to our survey efforts than spotted owls. Most biases associated with our incidental data on barred owl occupancy, reproductive status and rate of increase likely lead to underestimates of these parameters. For example, although we attempt to revisit every past activity center at a spotted owl site, more of those visits cover where the spotted owls were most recently located. Since current locations are often a result of spotted owls moving to areas of lower barred owl activity, less of our monitoring is devoted to the areas where barred owls are most abundant. Also, as barred owl densities have increased, it has become more difficult to discern the number of adjacent territories. Barred owls are not banded and we conservatively lump clusters of sightings within several kilometers of each other as one territory ("site") until we get simultaneous evidence of multiple pairs. Many barred owl sites with single occupancy were not visited frequently enough to determine pair status, or at the proper time to document reproduction. Consequently, our estimates of barred owl pair and reproductive status should be considered minimum estimates of these values, and are useful only as indices for comparison among years.

We recorded barred owls on 54 separate occasions representing an estimated 30 barred owl territories during spotted owl surveys in 2010. Additional detections resulting from calling

for barred owls (9 detections, 4 additional sites), radio telemetry (3 additional sites) and acoustic monitoring devices (1 additional site) are not included in this total, so as not to bias comparisons of barred owl detections with previous years when these methods were not used. To standardize for variable survey effort between years, the annual count of occupied barred owl sites is divided by the number of spotted owl site visits (Fig. 4). The annual rate of increase in this index, calculated from the log of the slope from 1992-2010, was 13.0 % a year.

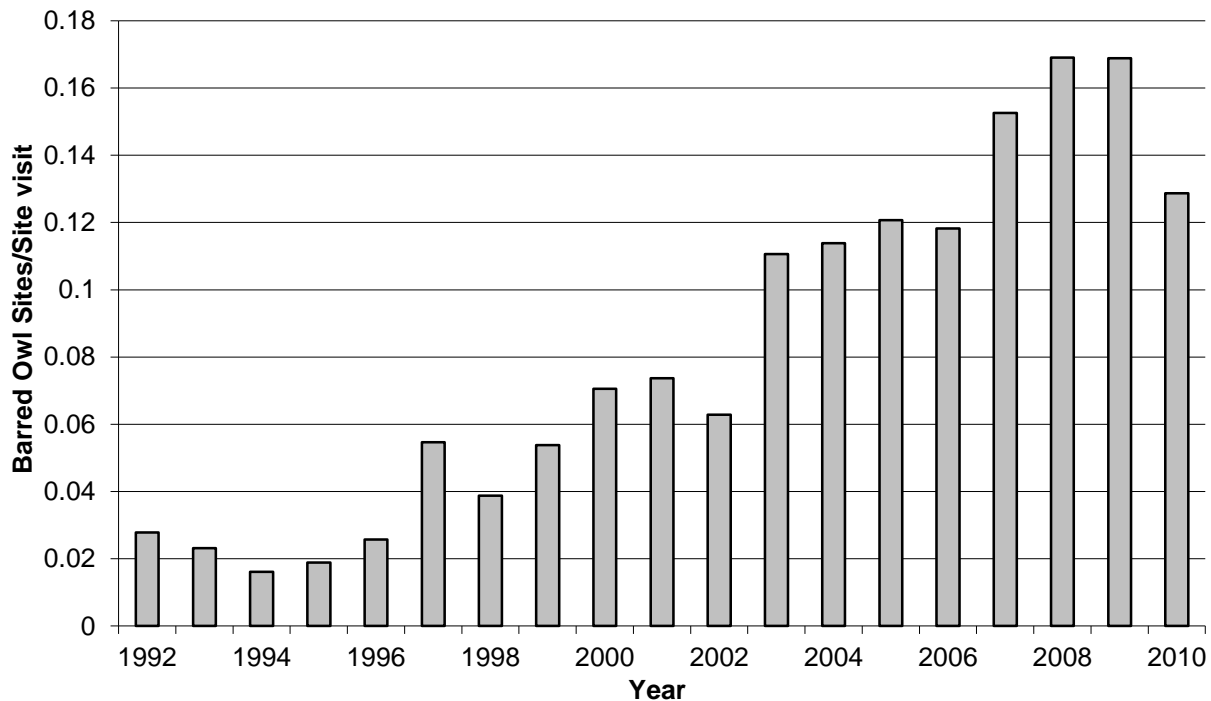


Figure 4. Number of occupied barred owl sites detected, standardized by survey effort, Olympic National Park, 1992-2010. Excludes sites detected as a result of using barred owl calls, radio-telemetry, or acoustic monitoring devices.

When considering barred owls detected by all methods, 24 barred owl pairs and 14 single barred owls were detected. Eight of these were new territories, bringing the total number of known barred owl sites in ONP to 98. This is not a complete count, only the rough number of territories that fall in the areas that get some survey coverage. We documented nesting by barred owls at 13 sites, fledging a minimum of 22 juveniles. An index of barred owl reproduction (the number of juveniles detected/occupied barred owl site) correlated significantly with annual rates of spotted owl fecundity from 1992-2006 at ONP (Spearman's $\rho = 0.726$, $p < 0.01$).

Hybridization between barred and spotted owls has been documented, but appears to be infrequent after the initial period of colonization (Hamer et al. 1994; Herter and Hicks, 2000; Kelly and Forsman, 2004). We know of two hybrids in the park, a male and a female, both

paired with barred owls inhabiting former spotted owl activity centers. The female was confirmed non-nesting and paired with a male barred owl at a spotted owl site. The male hybrid was not located, although unknown *Strix* species juveniles were found in the area where this owl has been found in past years.

Morse Creek Barred Owl Study

We conducted a fourth year of work on a 7000 acre study area in the Morse Creek drainage, where we are monitoring density and space use by barred owls. The area was selected for its combination of both year-round road and trail access and the history of monitoring at all known spotted owl sites. Although we did not receive funding to radio-mark all barred and spotted owls or to continue landscape scale density surveys, we have continued demographic monitoring of the spotted owls in the area and a pilot barred owl radio-telemetry project.

At five monitored sites, surveyors located one nesting pair of spotted owls, one resident single male and two banded males occupying a third site. Surveys prior to 2008 located five pairs of barred owls in this area and we have successfully installed backpack radios on one member of each known pair (Table 1). We have had good capture success using a barred owl decoy, taped calls and mist net in early spring, capturing at least one barred owl on seven of eight attempts when they responded. Despite several radios failing in the early nesting period this year, we confirmed pair occupancy by barred owls at four of five sites, and received reports of juveniles at the fifth, although we were unable to confirm this. We determined the nest tree at three sites, and found two juveniles each at two sites. At both successful nests we found a juvenile mortality soon after fledging, one from a leg wedged in a cracked cedar trunk and another from unknown causes but most likely starvation/exposure.

Table 1 : Radio-marked barred owl summary data

| Site Name | Sex | Radio on | Radio off (Cause) | Locations |
|-----------------|-----|----------|---------------------|-----------|
| Morse Cr. Flats | F | 3/18/08 | 4/28/10 (battery) | 84 |
| Lake Cr. Flats | F | 3/12/09 | Active | 63 |
| Lake Dawn | M | 3/20/08 | 3/26/10 (battery) | 84 |
| Cox Valley | F | 3/22/08 | 1/29/10 (battery) | 75 |
| Ennis Creek | F | 3/27/08 | 12/6/08 (mortality) | 34 |

Effects of Barred Owls on Spotted Owls

At ONP, rates of pair occupancy have declined at spotted owl sites following the first barred owl detection there. At sites where spotted owls have remained after barred owls were detected, they have both moved farther from their original location and shifted to higher elevations, relative to spotted owl sites without barred owls (Gremel, 2005).

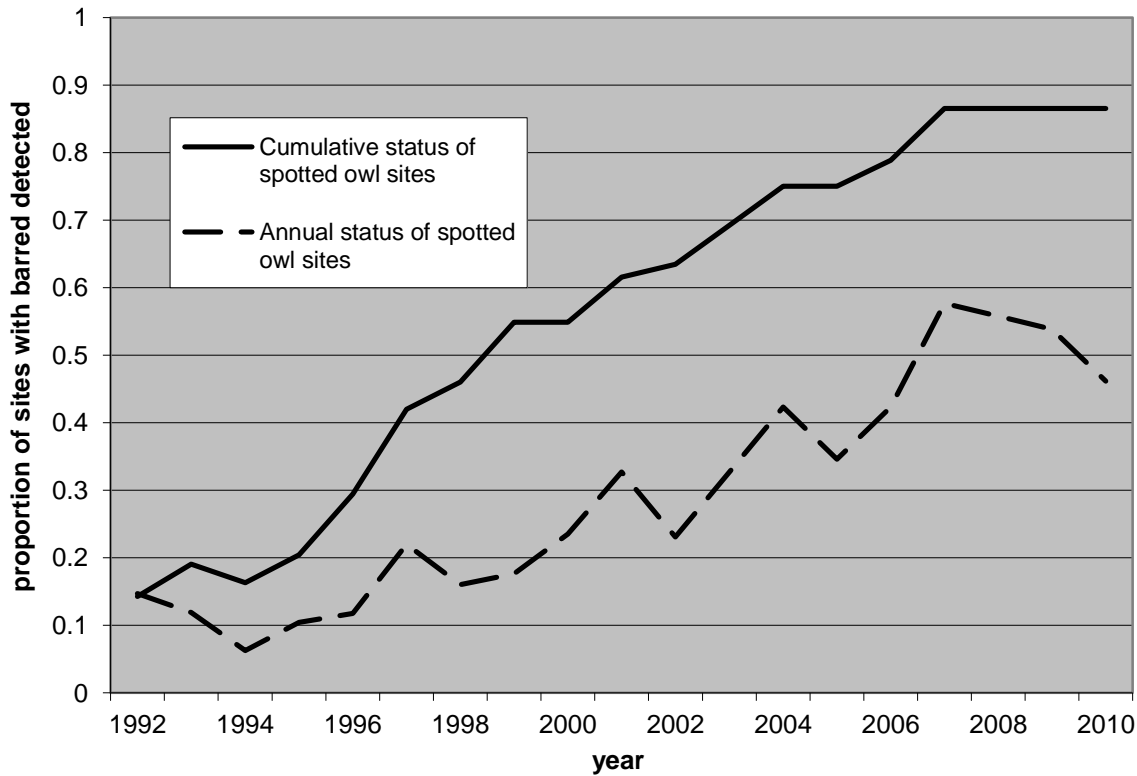


Figure 5. *Proportion of monitored spotted owl sites (N=52) with barred owls detected, Olympic N.P., 1992-2010. A spotted owl site is defined as the area within 800m of the activity centers occupied between 1990 and 2010. The solid line is the proportion of sites that have ever had a barred owl detected in this area, the broken line is the annual proportion of sites where barred owls were detected.*

Barred owls have now been detected at 45 of 52 monitored spotted owl sites (Fig. 5). In 2010 we detected barred owls within 800 m of 24 monitored spotted owl sites in the course of demographic monitoring, but did not detect them at any of the seven spotted owl sites where they were not found in previous years. Although we fail to detect barred owls on an annual basis at many of the 45 sites where they have been recorded, this is more likely due to low detection probabilities for this species on spotted owl surveys rather than true absence. Over the last three years (2008-2010), we located barred owls at 39 of these sites with spotted owl

surveys. We surveyed four of the six remaining sites without recent barred owl detections using barred owl calls and field recorders this year and detected barred owls at all four.

None of the 21 occupied spotted owl activity centers were located within 800m of a barred owl detection this year. Spotted owls at six sites were found within 800 meters of barred owls detected in previous years.

Data from ONP suggest that spotted owls are avoiding areas occupied by barred owls rather than remaining and going undetected for many years. There has been no time trend in annual spotted owl recapture probabilities, which have generally ranged between 0.6-0.8 (Anthony, et al., 2006). The average per visit rate of spotted owl detection at occupied sites was 0.80 ($N = 21$ sites) in 2010, the highest recorded in 19 years of monitoring (ONP, unpub. data). This rate has ranged between 0.48 and 0.72 and has shown no decline over time. While some data suggest that spotted owls are less vocal in the presence of barred owls (Crozier et al., 2006), we frequently detect owls on daytime visits whether or not they vocalize. Since we began recording the information in 2004, 43% of initial spotted owl detections have been visual, often as a result of owls flying in to surveyors, or surveyors investigating mobbing songbirds. We also locate spotted owl roosts by sign including pellets, whitewash, or feathers which can direct searchers to roosting owls, or in the case of some feathers, identify the species occupying a site.

Other Species

In addition to barred and spotted owls, we also record incidental responses by northern goshawks (*Accipiter gentilis*) and great-horned owls (*Bubo virginianus*). The number of occupied goshawk sites encountered during owl monitoring has ranged from 0-6 per year. This year we encountered goshawks at eight sites, and found two nesting pairs, each with 2 juveniles. We did not detect great-horned owls, which are rare in the mid-elevation conifer forests of ONP where most monitoring takes place.

COOPERATIVE EFFORTS

2004/2009 Spotted Owl Demography Workshops

We participated in the northern spotted owl demographic workshop, held January 2009 in Corvallis, OR. This was the fifth analysis to examine data from the spotted owl demography studies being conducted across the species range. Data from federal lands on the Olympic Peninsula (ONP and Olympic National Forest combined) were analyzed along with those from 10 other demographic studies to estimate age-specific rates of fecundity, survival and population trends across the range of the northern spotted owl. Results of this analysis will be published this winter.

The previous analysis, completed in 2005, found that fecundity rates were stable, both on the Olympic demographic study area and when measured across the range of the northern spotted owl. Annual apparent survival estimates ranged from 0.75 to 0.89 for territorial non-juvenile spotted owls. Olympic was one of five study areas with evidence of a decline in survival rates over time; three of the five studies with declining survival were also located in Washington State.

Range-wide, the decline in numbers of territorial northern spotted owls was estimated to be 4.1% a year. Point estimates for 13 of 14 study areas fell below 1 (stable population), and there was evidence for a statistically significant population decline at 8 of these, including Olympic. The estimate of decline in the Olympic demographic study was 4.4% a year. The 95% confidence interval for this estimate barely included 1, indicating a strong probability, although slightly less than 95%, that spotted owl numbers were actually declining. Overall, it appeared that spotted owl populations in Washington were faring worse than those in Oregon and California. Population trends were more favorable on federal lands (declining 2.5% a year) than on all other study areas (declining 6.6% a year).

Northern Spotted Owl Presence/Absence Monitoring

The need for a more extensive survey method, designed to track both population trends and changes in distribution, is a priority for the NPS. Beginning in 2006, the agency has implemented these surveys as part of a long-term landbird monitoring program. Crews from the Institute for Bird Populations survey randomly located 1.8 km-long transects, using protocols developed for a spotted owl inventory conducted at ONP in the early 1990's. After conducting point counts for songbirds at stations along these transects, surveyors call for spotted owls at five stations located 400 meters apart. Stations are called for 10 minutes and all stations in forested habitat are called, regardless of elevation. These surveys are providing an inexpensive test of the feasibility and statistical power of implementing a larger scale presence/absence survey.

Overall response rates by spotted owls have been quite low (Table 2). In 2010, only a single spotted owl was detected on 58 transects in Olympic, North Cascades and Mt. Rainier National Parks. Since 2005, surveys in these parks have detected 6 spotted owls and 20 barred owls on 292 transects.

Table 2: Results of presence/absence owl surveys performed by Institute for Bird Populations landbird monitoring crews. Includes barred and spotted owls detected at or associated with owl calling stations, as well as incidental detections outside of formal survey.

| Year | National Park | Transects Called | Stations Called | Barred Owl detections | | | Spotted owl detections | | |
|------|---------------|------------------|-----------------|-----------------------|------------------|------------|------------------------|------------------|------------|
| | | | | At Stations | Between Stations | Incidental | At Stations | Between Stations | Incidental |
| 2005 | Mt. Rainier | 9 | 40 | 0 | 1 | 0 | 0 | 0 | 0 |
| | N. Cascades | 11 | 53 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olympic | 8 | 34 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2006 | N. Cascades | 12 | 57 | 1 | 1 | 0 | 1 | 0 | 0 |
| | Olympic | 10 | 44 | 3 | 0 | 0 | 1 | 0 | 0 |
| 2007 | Mt. Rainier | 19 | 114 | 0 | 1 | 1 | 0 | 0 | 0 |
| | N. Cascades | 22 | 104 | 2 | 1 | 2 | 0 | 0 | 0 |
| | Olympic | 21 | 95 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2008 | Mt. Rainier | 20 | 94 | 1 | 1 | 0 | 0 | 0 | 0 |
| | N. Cascades | 20 | 96 | 3 | 0 | 0 | 0 | 0 | 0 |
| | Olympic | 21 | 95 | 0 | 0 | 3 | 1 | 1 | 0 |
| 2009 | Mt. Rainier | 16 | 69 | 1 | 0 | 0 | 0 | 0 | 0 |
| | N. Cascades | 23 | 97 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Olympic | 22 | 91 | 2 | 0 | 2 | 1 | 0 | 1 |
| 2010 | Mt. Rainier | 17 | 74 | 1 | 0 | 0 | 0 | 0 | 0 |
| | N. Cascades | 19 | 80 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Olympic | 22 | 95 | 0 | 0 | 1 | 1 | 0 | 0 |

Other Interagency Activities

- Served as NPS representative on the Northern Spotted Owl Recovery Plan Implementation Team and Barred Owl Working Group (Gremel).
- Provided records of all field visits and annual site summary information to the Washington Department of Fish and Wildlife for a state-wide spotted owl database.
- Supplied northern goshawk location data to Washington Department of Fish and Wildlife for a study of the genetics of that species in the Olympics.

BUDGET

All funding was provided by the NPS through the Regional Ecosystem Office of the Northwest Forest Plan. Funding for spotted owl monitoring was provided at the level of \$141,600 in FY 2010. An additional \$5000 was provided to support NPS participation in northern spotted owl recovery planning and the barred owl workgroup.

ACKNOWLEDGEMENTS

The project is only possible due to the hard work, skill and dedication of the field crew. Declining spotted owl numbers have required an increasing number of daylong no response searches in roadless wilderness and often difficult weather conditions. We were fortunate to have the entire paid field crew from 2009 return this season. E.R. Burke, A.E. Farris, L.H. Graham, A.A. Green, S.A. Gremel, T.J. Kay, K.L. Mittelsteadt and K.A. Williamson performed the fieldwork in 2010. Patti Happe, ONP Wildlife Branch Chief, provided overall project supervision and administration, T.J. Kay assisted with coordination and supervision of the field work, and R.A. Hoffman and K.F. Beirne provided GIS support and analysis. Liz Kelly of the USFWS generously provided the program used to map barred owl locations relative to spotted owl sites.

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APPENDIX 1

Nesting status and success rate of female spotted owls of all age classes, at monitored sites in Olympic National Park, 1992-2010.

| | Non-nesting | Nesting | Unknown nest status | Total females | Proportion nest status known | Proportion females nesting | Nest success ¹ |
|--------------------|-------------|---------|---------------------|---------------|------------------------------|----------------------------|---------------------------|
| 1992 | 1 | 15 | 7 | 23 | 0.70 | 0.94 | 0.93 |
| 1993 | 16 | | 5 | 21 | 0.76 | 0 | * |
| 1994 | 3 | 24 | 7 | 34 | 0.79 | 0.89 | 0.92 |
| 1995 | 15 | | 6 | 21 | 0.71 | 0 | * |
| 1996 | 5 | 28 | 3 | 36 | 0.92 | 0.85 | 0.92 |
| 1997 | 15 | 8 | 6 | 29 | 0.79 | 0.35 | 0.75 |
| 1998 | 1 | 24 | 5 | 30 | 0.83 | 0.96 | 0.91 |
| 1999 | 9 | | 5 | 14 | 0.64 | 0 | * |
| 2000 | 17 | 10 | 4 | 31 | 0.87 | 0.37 | 0.56 |
| 2001 | 16 | 8 | 4 | 28 | 0.86 | 0.33 | 1.00 |
| 2002 | 3 | 27 | | 30 | 1.00 | 0.90 | 0.92 |
| 2003 | 23 | | 3 | 26 | 0.88 | 0 | * |
| 2004 | 2 | 22 | 4 | 28 | 0.86 | 0.92 | 0.95 |
| 2005 | 20 | 1 | 3 | 24 | 0.88 | 0.05 | 1.00 |
| 2006 | 1 | 17 | 2 | 20 | 0.90 | 0.94 | 0.94 |
| 2007 | 13 | | 1 | 14 | 0.93 | 0 | * |
| 2008 | 1 | 16 | 2 | 19 | 0.89 | 0.94 | 0.94 |
| 2009 | 8 | | 2 | 10 | 0.80 | 0 | * |
| 2010 | 3 | 14 | 1 | 18 | 0.94 | 0.82 | 0.93 |
| Total ² | 172 | 214 | 70 | 456 | 0.84 | 0.49 | 0.90 |

¹ Proportion of nest attempts that result in at least one fledgling, calculated on nests with known outcomes

² Where totals are calculated on proportions, they are the unweighted averages of the annual means

* No nesting attempts